PARTNERING to save VALLEY CREEK

By Betsie Blumberg and Brian Lambert

Valley Creek is an outstanding trout stream in Pennsylvania (fig. 1). Twelve miles long, the creek runs through five townships just north of Philadelphia and flows through Valley Forge National Historical Park where it empties into the Schuylkill River. This limestone stream, remarkable for its beauty, is an important recreational resource for the five-county area around Philadelphia.

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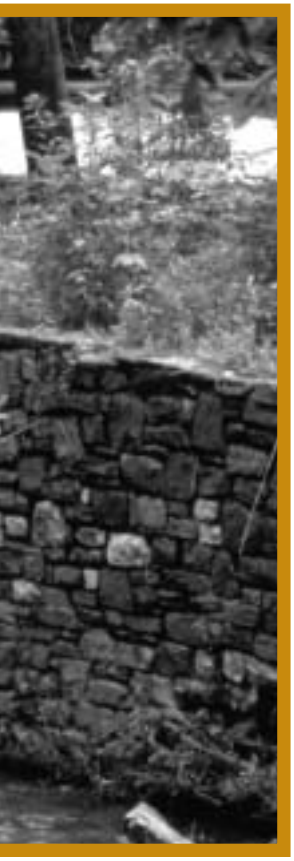

Figure 1. Located north of Philadelphia and flowing through Valley Forge National Historical Park, Valley Creek is an important recreational resource for area residents. In 1993 the creek was officially designated as having "exceptional value," an important management tool for protecting the creek's water quality.

Figure 2. Development in the area of Valley Creek has led to increased erosion of the stream bank, which threatens the collapse of Pennsylvania Route 252. In addition to traditional engineering, the partnership to restore Valley Creek is using soil, rocks, and plants in bioengineering solutions to stabilize stream banks.

The importance of the creek to the local communities is evidenced by the fact that most of its corridor is still wooded, providing food and shelter for a variety of terrestrial animals. Its waters support a thriving aquatic biological community. The Pennsylvania Fish and Boat Commission has designated it a Class A Wild Trout Fishery. Several parks and preserves have been established along its banks to protect the creek and allow public access.

Not surprisingly, Valley Creek is threatened by the booming urban environment from which it provides a respite. In the last few decades, the creek's 23-square-mile (60-square-kilometer) watershed has seen tremendous industrial, commercial, and residential expansion. This development menaces the stream's water quality. Furthermore, as the stream rushes along carrying sediment-laden runoff, it endangers roads, buildings, and bridges as it undercuts its banks, threatening the collapse of Route 252 along its east bank (fig. 2) and endangering archeological sites and the Valley Creek hiking trail at the national historical park along the west bank.

To protect such resources takes political action and in-depth understanding of the stream's ecology. Fortunately, the natural resources staff at the park are not alone in their efforts to protect Valley Creek. Several local conservation groups have devoted their energies to influencing state and municipal agencies to accord Valley Creek maximum regulatory protection, and the Pennsylvania Department of Transportation (PennDOT) has been working with the park to save the stream banks. Four projects illustrate the success of the national historical park's cooperation with other governmental and private groups.

An "exceptional value" creek

Pennsylvania classifies its waterways to designate the acceptable level of water quality degradation that may result from activities in the watershed. This classification guides local municipalities in awarding permits to developers. The most restrictive classification is "exceptional value." Streams with this classification cannot be degraded at all.

In 1987 the Valley Creek Coalition began petitioning the Pennsylvania Department of Environmental Protection to upgrade Valley Creek to exceptional value. The coalition included the Valley Forge chapter of Trout Unlimited; the Open Land Conservancy; the Green Valley Association; the West Chester Fish, Game, and Wildlife Association; and Valley Forge National Historical Park. Many other groups, businesses, and individuals jumped on the bandwagon, as well.

This initiative required the support of five townships and several industries because they all had to develop alternatives for the discharge of their wastewater. The coalition worked with politicians at every level, from local

communities to the state capitol. Trout Unlimited sponsored a letter-writing campaign that sent 3,000 letters to the Water Quality Management Department of the Pennsylvania Department of Environmental Protection and the Pennsylvania Fish and Boat Commission.

In 1993, after six years of hard work, the Pennsylvania Environmental Quality Board, which reviews recommendations of the Department of Environmental Protection, approved the designation of exceptional value for Valley Creek, providing an important management tool for protecting the creek's water quality.

Controlling storm water

The Valley Creek Coalition did not disappear after that victory. The problem of storm water flow into Valley Creek remained, and the coalition felt that the Department of Environmental Protection and the townships were not regulating new construction in conformity with the exceptional value classification. In March 2000 the coalition appealed the storm water permit for a company that was expanding its corporate campus in the watershed.

Storm water runoff becomes a problem when development makes large surface areas impervious. When storm water floods into Valley Creek, it raises the water temperature and introduces sediment that turns the water the color of mud. These factors destroy fish habitat, smother aquatic insects and fish fry, cover up fish eggs, and increase erosion. Sensitive species such as brook trout begin to disappear when as little as 2% of the watershed is covered by impervious surface (such as roads), according to the Maryland Biological Stream Survey, a multiyear study of stream health. Furthermore, the stream channel widens and deepens in response to the increased flow, destabilizing the stream banks.

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In response to the coalition's appeal, in September 2000 the Department of Environmental Protection added a postconstruction storm water control component to its permitting requirements for the Valley Creek watershed. The new component requires that storm water be infiltrated into the ground so that runoff is no greater than it was before development. Because undeveloped land in the watershed is officially considered meadow, postconstruction runoff must equal what would flow from a meadow. Permit applicants must also show that their grading and outlet structures will prevent storm water from causing erosion, carrying pollution, or raising stream water temperature.

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Because Valley Forge National Historical Park is at the bottom of the Valley Creek watershed, everything that flows into the creek eventually impacts the park, so it is especially beneficial to the park to work with the coalition to protect Valley Creek.

Stabilizing the stream banks

The national historical park and PennDOT have a common problem. Valley Creek is eroding its banks so severely that Route 252, which runs along its east bank, is in danger of collapsing. In fact, a 200-foot (67-meter) portion of it did collapse in 1990. Beneath the road is a sewer main that carries 8 million gallons of sewage per day. A break in the sewer would be disastrous, severely polluting the creek, killing stream life, and further damaging habitat. On the west bank, the Valley Creek hiking trail has been damaged in the past and is constantly in similar danger.

In 2000 Valley Forge National Historical Park and PennDOT signed a memorandum of agreement stating that they would split the $600,000 cost of repairing and stabilizing 2,100 feet (644 meters) of stream bank. The park's share came from regional storm damage funding related to Hurricane Floyd. The environmental assessment for the project is being written by the park's natural resource manager, Brian Lambert, and the park staff participated in designing the construction.

The restoration project combines conventional hard engineering with bioengineering, a "soft"approach that uses rock, soil, and plants. Different treatments will be used, appropriate to the characteristics of the three stream sections to be repaired. Bioengineering techniques will stabilize one section where coconut fiber rolls will be installed at the toe, and trees and shrubs will be planted on the upper parts of the stream bank. The second section of the stream bank is an outside bend, where erosive forces are greatest and will be protected by large riprap rock.

Along the third and longest stretch, the stream banks are 8 feet high, almost vertical, and composed of unconsolidated silt. In this section large rocks will strengthen the toe, and shrubs and trees will stabilize the top of the bank. In the middle, a 5-foot-high wall will be constructed using soil, shrubs, and branch-packing in a matrix of plastic geocells. (This technique was chosen where the bank cannot be excavated because of the sewer main behind it, and encroaching into the stream was to be avoided.) A geocell structure, or geoweb, is composed of layers of multiple plastic cells, each about 5 inches in diameter and 6 inches in height, that can be filled with soil, plants, rock, or cement and stacked to form a vertical wall. Branch-packing puts many long, live branches between layers of geocells (or any other kind of layering). The cut end of a branch goes into the soil in the stream

bank while the other end sticks out beyond the structure. The branches continue to grow, adding another live dimension to the restoration.

This project will enhance the riparian habitat while stabilizing the stream bank. After an archeological assessment of the site is finished, construction will begin and should be completed within a year.

Restoring a riparian buffer

In Colonial times, streamside woodlands were cleared and farmed along 1 mile of Valley Creek that is within the national historical park. Later, this land was converted to lawn. It was maintained that way until 2000 when PennDOT and the park joined forces to create a wooded riparian buffer along 3,000 linear feet (915 meters) of the stream between the Pennsylvania Turnpike and the Knox covered bridge. PennDOT funded two-thirds of the project.

Woody vegetation is an excellent stabilizer of stream banks. It slows storm water, allowing it to infiltrate into the ground, filters runoff, and shades the creek, keeping its water cool. It also adds detritus to the water, which is food for fish, insects, and crustaceans. And the forest provides habitat for small animals and birds. The USDA Forest Service recommends a minimum 100-foot-wide (30.5-meter-wide) buffer on each bank.

The wooded riparian buffers at the national historical park are only 50 feet (15 meters) wide to avoid impacting the park's cultural landscape. Fibrous-rooted shrubs (3 feet tall; 0.9 meters) are planted in 20-foot-diameter (6.1-meter-diameter) clusters, and 8- to 12-foot-tall (2.4- to 3.7-meter-tall) trees are planted in 40-foot-diameter (12.2-meter-diameter) clusters, creating a mosaic of plantings and small openings (table 1). To protect the plants from being eaten by deer, plastic mesh guards are placed around newly planted tree trunks and a 7-foot-high (2.1-meter-high) vinyl mesh fence surrounds the shrub clusters (figs. 3 and 4). (Where two shrub clusters were experimentally left unfenced, the plants were completely consumed by deer.) This fencing design allows people and animals access to the stream because it does not form a continuous barrier along the stream bank. Park staff maintains the fences and controls exotic invasive plants. The new streamside woodland is coming along well.

Who benefits?

Valley Forge National Historical Park partners with many groups on many projects. The park benefits from the energy of committed organizations and agencies and from the fiscal resources they contribute.

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Table 1.
Trees and Shrubs Planted in Each Cluster

Trees	Shrubs
red maple *(Acer rubrum)*	southern arrowwood *(Viburnum dentatum)*
silver maple *(Acer saccharinum)*	redtwig dogwood *(Cornus stolonifera)*
smooth alder *(Alnus serrulata)*	silky dogwood *(Cornus amomum)*
ironwood *(Carpinus caroliniana)*	ninebark *(Physocarpus opulifolius)*
sycamore *(Platanus occidentalis)*	sweet pepperbush *(Clethra alnifolia)*
black willow *(Salix nigra)*	pussy willow *(Salix discolor)*
pin oak *(Quercus palustris)*	

Figures 3 (left) and 4. Project staff construct exclosures to protect woody vegetation planted in 20- and 40-foot-diameter clusters so that they will not be eaten by deer. Riparian vegetation stabilizes the soil and increases infiltration of storm water runoff. It also provides food and habitat for aquatic and terrestrial animals.

The park's partners benefit from the facilities and expertise that the park offers. Ultimately, of course, the resources being protected and enhanced are the primary beneficiaries of these partnerships. And because the park's natural resources are the public's to appreciate and enjoy, their stewardship benefits everyone.

Results and spin-offs

As a result of these partnerships, the survival and enhancement of Valley Creek as an outstanding natural, cultural, and recreational resource in the middle of an urban landscape has greatly improved. Exceptional value status adds an important management tool that can be used by both the National Park Service and Pennsylvania Department of Environmental Protection to protect the stream's water quality. A restored streamside woodland nurtures a growing fishery. Improved storm water control limits the creek's erosional power and enables landowners, such as the national historical park, to stabilize stream banks. These projects are rather high profile in that they are very visible, occur on a stream that is prized and protected by a large number of interest groups, and involve well-known partners, such as PennDOT.

An interesting and very beneficial cascading effect has occurred. Exceptional value status caused PennDOT to review its approach to protecting its assets (i.e., roads and bridges) along Valley Creek; this led to its partnership with the national historical park to stabilize stream banks along Route 252. In turn PennDOT chose the park for a riparian buffer project just upstream of Route 252, which was an important reason for the NPS Water Resources Division to fund the park's request to extend the upstream riparian restoration work on Valley Creek several hundred feet.

Of course, with all this interest in protecting the creek, it was politically untenable for the two townships, which encompass 90 percent of the watershed, not to improve their storm water ordinances. Both did, and now their ordinances require control not only of runoff rate, but also volume—a change sought by the park and environmental groups for more than a decade.

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"Triassic park" continued from page 15

This project has demonstrated the importance of conducting fieldwork-based inventories. In many cases, existing data, including field maps, are inaccurate; in extreme cases, actual localities may be positioned as much as three-quarters of a mile from where they were physically mapped. Thus, locality maps not based on fieldwork (e.g., Evanoff 1994) can be unreliable for use in management decisions. In addition, photographs of the older localities do not exist, making their exact relocation almost impossible. Current and future projects that provide accurate GPS data, detailed notes, and site photographs will improve protection and management of fossil resources at Petrified Forest National Park.

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